# SPECTROSCOPIA MOLECULAR

UN PERIODICO DE NOVAS E INFORMATIONES DE INTERESSE E VALOR AL SPECTROSCOPISTAS

Publicate in interlingua per Forrest F. Cleveland, Professor de Physica, Instituto Technologic de Illinois, Chicago 16. Consiliero linguistic, Dr. A. Gode, Division de Interlingua, Science Service, 80 East 11th St., New York 3. 12 numeros per anno, $2.25. Le periodico depende de receptas financiari ab illes qui beneficia de illo.

## LE SPECTRO MICROUNDIC E LE STRUCTURA DE CYANAMIDO

IN LE departimento de chimia al Universitate Birmingham in Anglaterra, J. K. Tyler, L. F. Thomas, e J. Sheridan ha obtenite le spectro rotational pur de $H_2N$-CN, HDN-CN e $D_2N$-CN inter 17,9 e 40,3 Gc/s (G = giga = $10^9$; c/s = cyclo/secunda). Le temperatura del cella esseva circa 60°C e le brancas Q e R esseva observate.

Le valores numeric de $B_o + C_o$ esseva

19.995,1,
18.861,4,
17.899,7

Mc/s pro

$H_2N$-CN,
HDN-CN,
$D_2N$-CN,

respectivemente, con un incertitude de 1 Mc/s. In le mesme ordine, le valores de $B_o - C_o$ esseva 263,7 ± 0,1, 347,8 ± 1, e 412,5 ± 0,5 Mc/s.

Es concludite que le molecula, in le stato de equilibrio, es planar e ha un symmetria $C_{2v}$ secundo un axe que contine le catena N-C≡N.

Le momento dipolic de $H_2N$-CN es 4,3 D, le qual es in bon concordantia con le momento obtenite in solution.

Le parametros structural es HNH = 120°, N-H = 0,939 Å, N-C = 1,328 Å, e C≡N = 1,178 Å. Parametros plus certe essera date quando le autores comple le investigationes nunc in progresso super altere isotopos. Plus detalios va apparer in Proc. Chem. Soc. 6

### GEMMA DE SAGESSA

IL NON habera jammais un stato vermente libere e illuminate usque ille stato recognosce le individuo como un potentia plus alte e independente, ab le qual omne su proprie potentia e autoritate es derivate, e le tracta correspondentemente.

-- DAVID HENRY THOREAU, Disobedientia Civil.

### SYMMETRIA MOLECULAR

IN LE mesme laboratorio, J. K. Tyler, A. P. Cox, e J. Sheridan ha usate le spectro microundic inter 20 e 40 Gc/s pro determinar le symmetrias de

$C_5H_5{}^{205}Tl$,
$C_5H_5{}^{203}Tl$,
$C_5H_5Mn(CO)_3$, e $C_6H_6{}^{52}Cr(CO)_3$.

Le spectro es del typo obtenite con rotores strictemente symmetric.

Le spectros prova que le compositos de cyclopentadienylo ha axes de symmetria $C_5$, le quales passa a transverso le atomos metallic e es perpendicular al anulos $C_5$ e $H_5$. Le axe

correspondente in le chromo tricarbonylic de benzena ha sin dubita le symmetria $C_{6v}$, sed isto non pote esser provate per le spectro microundic secundo le qual le symmetria poterea esser mermente $C_{3v}$. Le gruppos $(CO)_3$, quando presente, ha le symmetria $C_{3v}$ secundo le mesme axe.

Si on assume que le gruppo $C_5H_5$ es planar, le distantia ab le nucleo del atomo Tl al centro del anulo es 2,41 ± 0,01 Å. Si, de plus, CH = 1,08 Å, tunc CC = 1,43 ∓ 0,02 Å, e CTl = 2,705 ∓ 0,005 Å.

Un discussion plus extense de iste labor va esser publicate in le periodico Nature. ô

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## SPECTRO INFRARUBIE A GRANDE DISPERSION E CONSTANTES MOLECULAR DE $CO_2$

CHARLES-P. COURTOY del Facultate Universitari de N. D. de la Paix a Namur in Belgica ha publicate un grande obra super $CO_2$ in Ann. Soc. Sci. Bruxelles 73 (1959) 5-230.

Isto da le datos spectral infrarubie obtenite con grande dispersion inter le infrarubio photographic e 3440 K (K = kayser = unda/cm). Le $CO_2$ ordinari esseva usate, tanto como un specimen que contineva 66% del isotopo $^{13}CO_2$. Le curvas e lor interpretationes es date.

Plus que 4000 lineas de absorption esseva mesurate con bon precision. Istos se gruppa in 91 bandas que se origina ex le isotopos: $^{12}C^{16}O_2$, $^{13}C^{16}O_2$, $^{12}C^{16}O^{18}O$, e $^{13}C^{16}O^{18}O$.

Plure precisiones esseva obtenite pro $^{12}C^{16}O_2$. Un analyse complete esseva facite pro $^{13}CO_2$ e certe resultatos esseva obtenite pro le moleculas asymmetric. Pro $^{13}CO_2$, le constantes vibrational rotational es indicate. $B_o$ e $B_e$ es 0,39025 e 0,391635 K e $D_o$ es 13,7($10^{-8}$)K.

Le duplamento del nivellos pi e le effecto del resonantia Fermi super le nivellos de energia esseva studiate.

Dr. Courtoy merita le congratulationes de omne spectroscopista pro un tal grande contribution. ô

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## DETERMINATION DEL TERMINOS PERTURBATIONAL DE PLURE NIVELLOS DE RESONANTIA

IN UN articulo supplementari, Dr. Courtoy e Ph. Passau (Ann. Soc. Sci. Bruxelles 72(1958)75-9) ha considerate le determination de terminos perturbational de plure nivellos de resonantia. Isto esseva facite per utilisar le relationes inter le functiones symmetric del valores observate insimul con le elementos del matrice de perturbation.

Pro 2 nivellos in resonantia, iste relationes es ben-cognoscite. Le autores generalisava le relationes e applicava los al resonantia Fermi in $CO_2$. ô

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UN SPECTROSCOPO de mano non costose con le qual scientistas juvene de plus que nove annos pote observar le colores continite in lumine pote esser obtenite ab le Science Materials Center, 59 4th Ave., New York 3, N.Y. a un costo de $2.00. Le elemento basic es un grilliage de diffraction con 13.400 lineas per 2,54 cm. Includite es varie equipamentos auxiliari e un libro experimental de 16 ps. Le numero de catalogo es 0100.

Etiam disponibile es un grilliage de diffraction e un libro de instructiones pro le construction de un spectroscopo de mano. Le costo es $0.30 e le numero de catalogo es 0101.

Altere equipamentos scientific etiam es disponibile. ô

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CHARLES H. TOWNES, professor de physica al Univ. Columbia, ha date su patentes pro le "maser" al Research Corporation, le qual esseva fundate per Dr. Frederick G. Cottrell. Omne

le receptas financiari del corporation es distribuite a institutiones educational pro le supporto de recerca basic. "Maser" es un parola inventate per Dr. Townes qui surveliava le construction del primo maser in 1954. Le parola significa un instrumento pro le "microwave amplification by the stimulated emission of radiation" (amplification microundic per le emission stimulate de radiation). ô

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MICHAEL KASHA, professor de chimia physic al Florida State University, ha essite appunctate chef del departimento. Dr. Kasha dava le Lecturas Reilly al Universitate Notre Dame (Indiana) in maio, e va servir como professor visitante de chimia physic al Universitate Harvard durante le anno academic 1959-60. ô

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M. G. K. PILLAI, del Universitate Annamalai in India, ha recipite un subvention de viage Fulbright, secundo un littera ab Prof. K. Venkateswarlu. Dr. Pillai va usar isto pro su transportation a Chicago ubi ille passara un intervallo de recerca in le laboratorio de spectroscopia al Instituto Technologic de Illinois. ô

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HERMAN WEISSMAN ha essite promovite al position de Professor Associate de Physica al Branca Chicago del Universitate Illinois. ô

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UN SPECTROSCOPISTA molecular pro recerca a alte temperaturas es desirate per le Division de Instrumentos de Controlo del Compania Warner e Swasey (34 W. 33rd St., New York 1). Cercate es un physico con un cognoscentia del spectroscopia infrarubie de micre moleculas pro recerca basic in iste campo. Un cognoscentia del theoria del spectros vibrational rotational e un familiaritate con le instrumentation infrarubie es desirabile, sed le equivalentes in campos relatate pote esser acceptabile. Le salario e le responsabilitates dependera del qualificationes del applicante. ô

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## FREQUENTIAS VIBRATIONAL DE MOLECULAS ISOTOPE

UN METHODO simple pro determinar le frequentias fundamental de moleculas in le quales atomos de D ha reimplaciate atomos de H ha essite disveloppate per N. K. MOROZOVA e V. P. MOROZOV (Optika i Spektroskopiya 5(1958)535-41). Le frequentias es obtenite ab le datos de massa spectroscopic e ab le rationes inter le frequentias vibrational de modificationes isotope.

Frequentias fundamental corrigite esseva obtenite pro $D_2S$, $HDS$, $ND_3$, e $PD_3$. Lor articulo contine 29 referentias. ô

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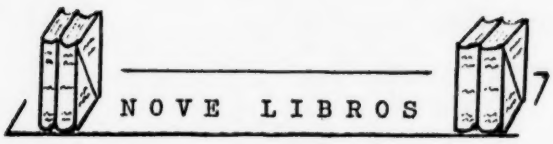
## RECERCAS SPECTROSCOPIC AL INSTITUTO TECHNOLOGIC DE MASSACHUSETTS

REIMPRESSIONES DE 3 articulos publicate in Spectrochimica Acta ha essite recipite ab Prof. R. C. Lord (Cambridge 39, Mass. S. U. A.)

Le prime (R. C. LORD, D. W. MAYO, H. E. OPITZ, e J. S. PEAKE; 12(1958) 147-53) concerne se con le preparation e le spectros vibrational de disilylacetyleno. Le spectros monstra que le symmetria es $D_{3d}$ e que le molecula ha un rotation libere interne.

Le secunde (G. R. BIRD, A. DANTI, e R. C. LORD; 12 (1958) 247-52) tracta del spectro de absorption rotational pur de $NO_2$ in le region 50-200 μ. Le resultatos indica que iste molecula es un rotor symmetric prolate con un grande distortion rotational. Le constante rotational A - (B + C)/2 es 7,573 K (K = kayser = unda/cm) e le constante de distortion rotational $D_K$ es $-2,24(10^{-3})$ K.

Le tertie (A. DANTI e R. C. LORD; 13 (1958) 180-91 discute le analyse rotational del bandas absorptionic parallel in benzena, benzena-$d_3$ symmetric, benzena-$d_6$, e pyridina, e le transitiones inter statos excitate. ô




• Infrared Absorption Spectra, Index for 1945-57 (Spectros Absorptionic Infrarubie, Indice pro 1945-57). H. M. HERSHENSON, Academic Press, 111 5th Ave., New York 3; London S.W.1; 1959. 111 ps. 20 x 28 cm. Proxime a $7.00.

PROVIDE UN indice al spectros absorptionic infrarubie publicate in 32 jornales american e europee. Le 16000 articulos include compositos de quasi omne typo. "Spectros de Absorption Ultraviolette e Visibile, Indice pro 1930-1954" per le mesme autor etiam es disponibile -- vide Spec. Mol. 5 (1956) 48.

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• Nuclear Spectroscopy Tables (Tabulas Spectroscopic Nucleari). A. H. WAPSTRA, G. J. NIJGH, e R. VAN LIESHOUT, Interscience Publishers, 250 5th Ave., New York 1; 1959. 142 ps. $8.90.

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• The Devil's Repertoire or Nuclear Bombing and the Life of Man (Le Repertoire del Diabolo o le Bombar Nucleari e le Vita del Homines). VICTOR GOLLANCZ. Doubleday and Co., 501 Franklin Ave., Garden City, L.I., N. Y.; 1959. 192 ps. 14 x 21 cm. $2.50.

UN PETITION forte pro sanitate nucleari per un publicator britannic distinguite. Un caso convincente pro disarmamento nucleari unilateral. Deberea esser legite sin prejudicio per omnes.

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• Common Sense and Nuclear Warfare (Senso Commun e le Guerra Nucleari). BERTRAND RUSSELL. Simon and Schuster, 630 5th Ave., New York 20; 1959. 92 ps. 13 x 20 cm. $2.50.

LE OBJECTIVO es monstrar un medio pro le obtention del pace que deberea esser acceptabile a omne nation in le mundo. Nos non pote pensar plus del guerra in le terminos traditional del politica de potentia proque le guerra nucleari resultara in destruction pro e le victor e le vincito. In le facie del periculo nucleari commun, un programma de defensa commun es un necessitate. Le autor propone un tal programma e disveloppa le ideas que ille presentava in su correspondentia con Srs. Khrushchev e Dulles. Ille analysa le periculos de avantiar al orlo del guerra (brinkmanship) e del disveloppamento e accumulation de armas sophisticate. Ille presenta passos specific verso disarmamento e le establimento de un Autoritate International.

Scribente con claritate e passion, le autor da a nos un libro que es al mesme tempore urgentemente de nostre die e in le grande tradition philosophic: un essayo a junger le Potentia, que pote ducer al destruction, con le Sagessa, que pote ducer al pace.

Certemente, si le homines non pote maestrar le monstro nucleari, eliminar le grande crimine del guerra, e comenciar a viver conjunctemente con relationes cordial super iste micre planeta, il habera nulle futuro pro le spectroscopia, o alicun altere cosa. ô

## REVISTAS

-- Resonantia paramagnetic. J. OWEN, Laboratorio Clarendon, Univ. Oxford, Anglaterra. J. Inorg. and Nuclear Chem. 8 (1958) 430-6.

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-- Resonantia magnetic nucleari. R. E. RICHARDS, Collegio Lincoln, Univ. Oxford, Anglaterra. J. Inorg. and Nuclear Chem. 8 (1958) 423-29.

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-- Le base physic del resonantia nucleari magnetic. P. HUBER, Univ. Basel, Switza. Chimia (Switza) 13 (1959) 1-15. (In germano.)

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-- Applicationes del resonantia nu-

cleari magnetic al chimia. H. PRIMAS, ETH, Zürich, Switza. Chimia (Switza) 13 (1959) 15-23. ô

## MICROFILMS

LE SEQUENTE microfilms es obtenibile ab University Microfilms, Ann Arbor, Mich., S. U. A.

* Un studio a alte resolution de alicunes del bandas vibrational rotational de $^{12}C^{16}O_2$ e $H_2Te$. K. ORSSMAN, Univ. Ohio State, Columbus 10, Ohio, S. U. A. L. C. Card No. Mic 58-2643. 130 ps.

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* Le banda $\nu_2$ de HDO e le designo e construction de un spectrometro infrarubie. N. M. GAILAR, Univ. Ohio State. No. Mic 58-3421. 159 ps.

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* Un studio a alte resolution del bandas vibrational rotational de $NH_3$ a 6, 10, e 16 µ. J. GARING, Univ. Ohio State. No. Mic 58-3422. 195 ps.

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* Le spectros Raman e infrarubie de brucite, $Mg(OH)_2$. S. S. MITRA, Univ. Michigan, Ann Arbor, Mich., S. U. A. No. Mic 58-3713. 141 ps.

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* Le theoria del molecula de ozono. J. A. WEISS, Univ. Ohio State. No. Mic 58-7158. 137 ps.

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* Intensitates spectral infrarubie del molecula $H_2S$. M. T. EMERSON, Univ. Washington, Seattle, S.U.A. No. Mic 58-7359. 89 ps. ô

## ARTICULOS

:- Correction pro le intensitates del bandas absorptionic infrarubie. K. KURATANI e A. MINEGISHI, Depto. de Chimia, Univ. Tokio, Japon. Bull. Chem. Soc. Japan 31 (1958) 586-92. (In anglese.)

:- Le theoria del lampas Raman. I. P. SZOLCSÁNYI. Magyar Fiz. Folyóirat 4 (1956) 127-41. Le melior resultatos esseva obtenite con un singule lampa plus un reflector elliptic.

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:- Le spectros vibrational de trisilylamino e trisilylamino-$d_9$. D. W. ROBINSON, Univ. Johns Hopkins, Baltimore, Md., S.U.A. J. Am. Chem. Soc. 80 (1958) 5924-7.

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:- Constantes vibrational e le energia de dissociation de BF. V. M. TATEVSKIĬ, L. N. TUNITSKIĬ, e M. M. NOVIKOV. Optika i Spektroskopiya 5 (1958) 520-9.

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:- Spectro absorptionic ultraviolette de dicyanoacetyleno, N≡C-C≡C-C≡N F. A. MILLER e R. B. HANNAN, JR., Mellon Institute, Pittsburgh 13, Pa., S. U. A. Spectrochimica Acta 12 (1958) 321-31. Le prime vice le spectro ha essite reportate.

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:- Le uso del spectroscopia fluorescentic a radios X in le analyse chimic. E. T. HALL, Lab. de Recerca Archeologic, Univ. Oxford, Anglaterra. Endeavor 70 (1959) 83-87. Le progresso principal in le application del spectroscopia del radios X ha occurrite post 1945. Apparatos e resultatos es discutite.

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:- Un cella infrarubie pro micre specimenes gasose. D. S. RUSSELL, Consilio National de Recerca, Ottawa 2, Ontario, Canada. Can. J. Chem. 36 (1958) 1745-6. Le volumine del specimen es 7.5 millilitros.

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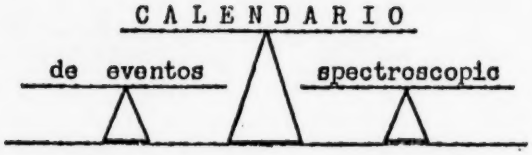
UN SESSION super le spectros molecular esseva tenite in Washington, D. C., le 2 de maio como un parte del programma del Societate American Physic. Summarios del 12 discursos es date in Bull. Am. Phys. Soc. 4 (1959) 290-2. Spectros de radicales libere, NO, $O_2$, NOCl, $CFCl_3^{35}$, $NH_3$ solide, propano, cyanido ethylic, e del rotores asymmetric esseva discutite. ô

## CALENDARIO de eventos spectroscopic



• JUNIO 22–JULIO 3. Curso infrarubie. Instituto Technologic de Massachusetts. (J. M. Austin, Camera 7-103, Cambridge 38, Mass., S. U. A.)

• JULIO 27–AUGUSTO 7. Curso infrarubie. Univ. Minnesota. (B. Crawford, Depto. de Chimia, Minneapolis, Minn., S. U. A.)

• AUGUSTO 19–22. Curso super le chromatographia de gases. Univ. Fisk, Nashville, Tennessee, S. U. A.

• AUGUSTO 24–29. Curso infrarubie. Univ. Fisk. (N. Fuson, Depto. de Physica, Univ. Fisk, Nashville 8, Tenn.)

• AUGUSTO 25–29. Curso infrarubie. Collegio Canisius, Buffalo. (H. A. Szymanski, Collegio Canisius, Buffalo 8, New York, S. U. A.)

• SEPTEMBRE 7–12. Symposio del gruppo europee del spectroscopistas molecular. Bologna. (A. Mangini, Instituto de Chimia Industrial, Univ. Bologna, Viale Risorgimento 4, Bologna, Italia.)

• SEPTEMBRE 14–16. Symposio super le spectroscopia applicate. Ottawa. (W. O. Taylor, Depto. de Minas, Edificios Parlamentari, Toronto, Ontario, Canada.)

• SEPTEMBRE 14–19. Colloquio Spectroscopic international. Lucerne. (H. Guyer, Colloquio Spectroscopic International, Cassa Postal, Schaffhausen, Switza.)

• OCTOBRE 11–16. Symposio spectroscopic. San Francisco. Emission optic, radios X, photometria de flamma, reconantia magnetic, ultravioletto, e infrarubio. (R. J. Wirshing, Cassa Postal 138, North-End Station, Detroit 2, Michigan, S. U. A.)

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SI Spectroscopia Molecular esserea de uso e valor in le bibliotheca de vostre institution, per favor propone su acquisition. ô

## VIBRATIONES NORMAL E PROPRIETATES THERMODYNAMIC CALCULATE DE METHYLTRICHLOROSILANO

METHYLTRICHLOROSILANO ES le plus simple de ille methylchlorosilanos que es e industrialmente importante e theoricamente interessante. K. Shimizu e H. Murata (Instituto Municipal de Recerca Osaka, Kita-ku, Osaka, Japon) ha recentemente calculate le frequentias fundamental, ha assignate los al modos normal de vibration, e ha calculate le proprietates thermodynamic. Le resultatos esseva publicate in le Bull. Chem. Soc. Japan 32(1959)46-50, in anglese.

Le tractamento del coordinatas normal esseva facite per uso del methodo Wilson del matrices F e G. Le elementos del matrice F esseva formate per uso del constantes de fortia in un campo de fortia del typo Urey-Bradley.

A causa del interaction inter le gruppos $CH_3$ e $SiCl_3$, le rotation secundo le linea C–Si es restringite e il ha un oscillation torsional. Iste vibration torsional pertine al specie $a_2$ le qual es prohibite in e le Raman e le infrarubio. Illo pote esser calculate quando le barriera de potential que restringe le rotation interne es cognoscite. Le investigatores estimava que le barriera es $V_o$ = 1,30 ± 0,25 kcal/mole e ex isto calculava un valor de 147 ± 15 K pro le numero de unda del vibration torsional.

Le producto del momentos principal de inertia $I_aI_bI_c$ = 1,48102($10^{-112}$)$g^3$ $cm^6$, le peso molecular esseva 149,496 unitates de massa atomic, e le numero de symmetria esseva 3. Usante istos valores del capacitate caloric, le energia libere, le entropia, e le contento caloric esseva calculate pro le stato ideal gasose e pro un pression de 1 atmosphera a 11 temperaturas inter 100 e 1000°K. A 298,15°K, istos esseva 17,02, 66,31, 83,33, e 24,88 $cal.grado^{-1}$ $mole^{-1}$, respectivemente. ô

Granville-Phillips Company
P. O. Box 191 PULLMAN, WASHINGTON LOgan 4-1130

## TYPE C ULTRA-HIGH VACUUM VALVE

Type C valves are specially designed and produced for use in glass or metal vacuum systems pumping to $5 \times 10^{-10}$ mm Hg or lower, and for higher pressure applications where the ultimate in gas purity must be maintained. These valves can be repeatedly baked out at temperatures up to 450°C without deteriorating and when baked out produce minimum contamination.

To exclude all contaminants, especially high vapor pressure materials such as zinc, cadmium, etc., extreme precautions are taken in the selection and processing of the materials which go into Type C valves. All brazing operations are carried out in hydrogen without the use of any other flux. As a result extremely low pressures may be easily achieved in systems using Type C valves. Low pressures or high purity may also be readily maintained using Type C valves. For instance, the amount of impurity gas introduced into a system is thousands of times less than that introduced by opening or closing a conventional glass stopcock sealed with any of the available vacuum greases.

Tests[1] have also shown that Type C valves can be sealed more tightly than any other continuously variable conductance valve described in the scientific literature. The conductance of these all metal valves may be readily varied from about 1 liter/sec to less than $10^{-14}$ liter/sec of nitrogen. Thus Type C valves can be made to serve admirably as precision controlled leaks over an extremely large conductance range. There have been many applications of this valve to mass spectrometer leak systems, to high energy accelerator gas sources, to all types of semiconductor surface studies, to high purity gaseous electronics experiments as well as in ultra-high vacuum studies.

Type C valves are rugged and durable and have proved themselves to be consistently reliable in laboratories all over the world.

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1. CONTROLLED LEAK: The extremely wide range of conductance and the ease and precision with which it may be adjusted over the entire range make this valve an ideal controlled leak. It requires no pumpout bypass and maintains high gas purity.

2. PRESSURES ATTAINABLE: With a Type C valve in a 1.5 liter system, pressures of $5 \times 10^{-10}$ mm Hg usually have been attained by pumping overnight with a clean WL 5966 ion guage after baking the system 3 to 4 hours at 400°C. Lower pressures can be obtained by baking for longer periods. Pressures of $5 \times 10^{-9}$ mm Hg are regularly obtained as soon as the system cools.

3. MATERIALS USED: Only materials suitable for use in an ultra-high vacuum system are used. The metals in contact with the vacuum are monel, A nickel, fine silver, Kovar and very low vapor pressure brazing alloys. All brazing is done in a hydrogen atmosphere. No fluxes of any type are used. Precautions are taken to minimize deterioration of the Kovar during repeated high temperature bakeouts. Type C valves can be baked out at temperatures up to 450°C.

4. TUBULATION: Two 12 mm O. D. Pyrex leads. We recommend that a glass bellows be inserted in each lead between the valve and the system to prevent stresses from being applied to the glassware during bakeout. Monel, nickel or OFHC copper tubulation can be supplied promptly on special order.

5. WARRANTY: Each Type C valve is leak tested on a Veeco MS9AB mass spectrometer to insure freedom from detectable leaks before shipment. These products are sold by the dealer with the following warranty and no other: The company warrants that it will repair F.O.B. its factory, or furnish F.O.B. its factory, a similar part to replace any material which within six months is proved to the satisfaction of the company to have been defective at the time it was sold, provided that all parts claimed to be defective shall be returned, properly identified, to the company, charges prepaid. This warranty to repair is the only warranty either express, implied or statutory, on which the products are to be purchased; and the company's liability in connection with this transaction is expressly limited to the repair or replacement of defective parts, all other damages and warranties, statutory or otherwise, being expressly waived by the purchaser.

[1] Rev. Sci. Instr. 26, 654 (1955).

ULTRA - HIGH VACUUM
VALVE, TYPE C

DATA SHEET C-13

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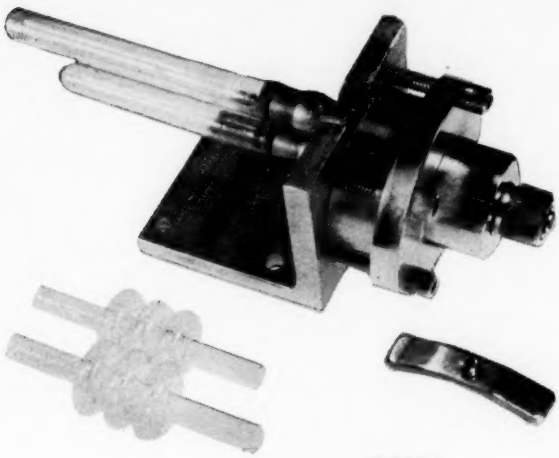
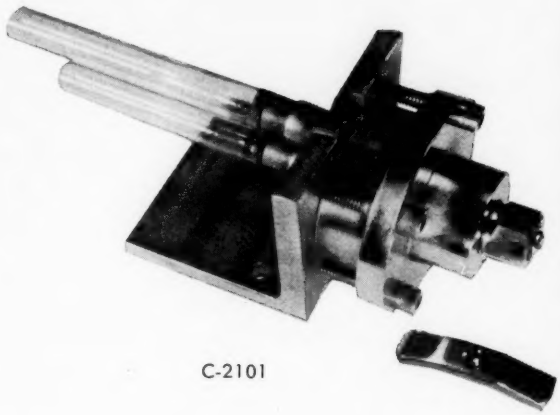


C-2100



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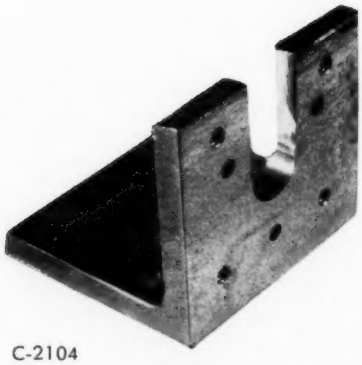

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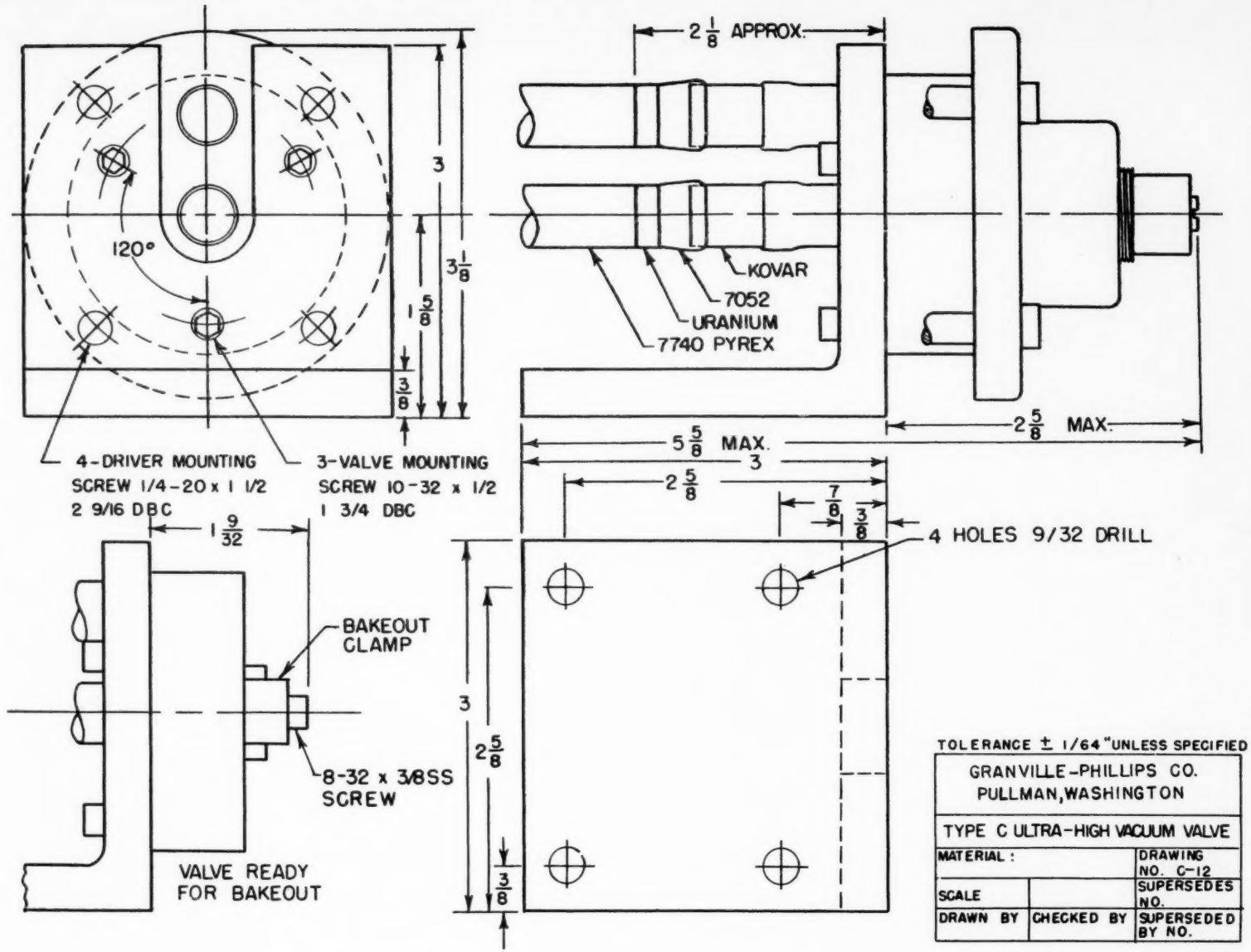
C-2105

C-2106

SEE REVERSE SIDE FOR MOUNTING DIMENSIONS




TOLERANCE ± 1/64" UNLESS SPECIFIED

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| TYPE C ULTRA-HIGH VACUUM VALVE | | |
| MATERIAL : | | DRAWING NO. C-12 |
| SCALE | | SUPERSEDES NO. |
| DRAWN BY | CHECKED BY | SUPERSEDED BY NO. |

Granville-Phillips Company
P.O. Box 191 PULLMAN, WASHINGTON LOgan 4-1130

# PRICE LIST

## TYPE C VACUUM VALVE

| Catalog No. | Description | Price List |
|---|---|---|
| C-2100 | Type C Valve Complete (Includes starred (*) items listed below and two bellows) | 160.00 |
| C-2101 | Type C Valve Complete (Includes starred items listed below) | 158.00 |
| C-2102 | *Type C Valve Only | 129.50 |
| C-2103 | *Driver Assembly (Complete with bearings and mounting screws) | 18.50 |
| C-2104 | *Bracket, Mounting | 9.80 |
| C-2105 | *Clamp, Bakeout | .70 |
| C-2106 | Bellows, Pyrex, Flexible, 12 mm OD tubulation, each | 1.60 |

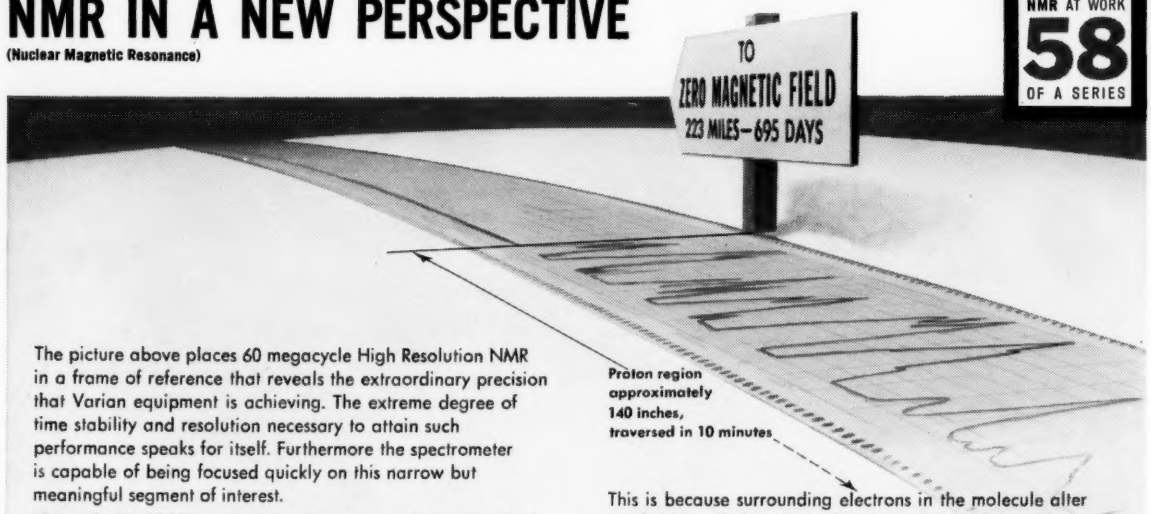
1. Please order by Catalog Number. See Data Sheet C-13 for identification of parts.
2. Prices of replacement parts, repairs and special items not listed will be supplied on request.
3. Prices are FOB Pullman, Washington; Terms—Net 30 days.
4. Shipping weight—9 lbs. per valve. Shipped by Railway Express for safety in transit.
5. Quantity discounts apply to one order to one destination on standard items.
   1 - 3 Net
   4 - 10 5%
   11 or over 10%
6. Delivery: All standard items are normally shipped from stock. A firm delivery date will be supplied upon request.

Effective Date: Jan. 1, 1958. Prices subject to change without notice.

# NMR IN A NEW PERSPECTIVE

(Nuclear Magnetic Resonance)

NMR AT WORK **58** OF A SERIES




The picture above places 60 megacycle High Resolution NMR in a frame of reference that reveals the extraordinary precision that Varian equipment is achieving. The extreme degree of time stability and resolution necessary to attain such performance speaks for itself. Furthermore the spectrometer is capable of being focused quickly on this narrow but meaningful segment of interest.

Theoretically 60.000 megacycle r-f energy would be absorbed by isolated hydrogen nuclei in a magnetic field near 14,092 gauss. Such an NMR spectrum would consist of a single narrow line. Actually, external fields infinitesimally larger than this must be applied to achieve this exact field strength at each particular chemical environment within the molecule. This is because surrounding electrons in the molecule alter the field locally by minute, but detectable, amounts. The spectrum of resonant peaks resulting from these shieldings are a description of the chemical environment. *The Varian 60 mc NMR Spectrometer solves chemical problems because it can detect significant shifts and splittings of as little as 1/10th milligauss out of an applied 14 kilogauss!*

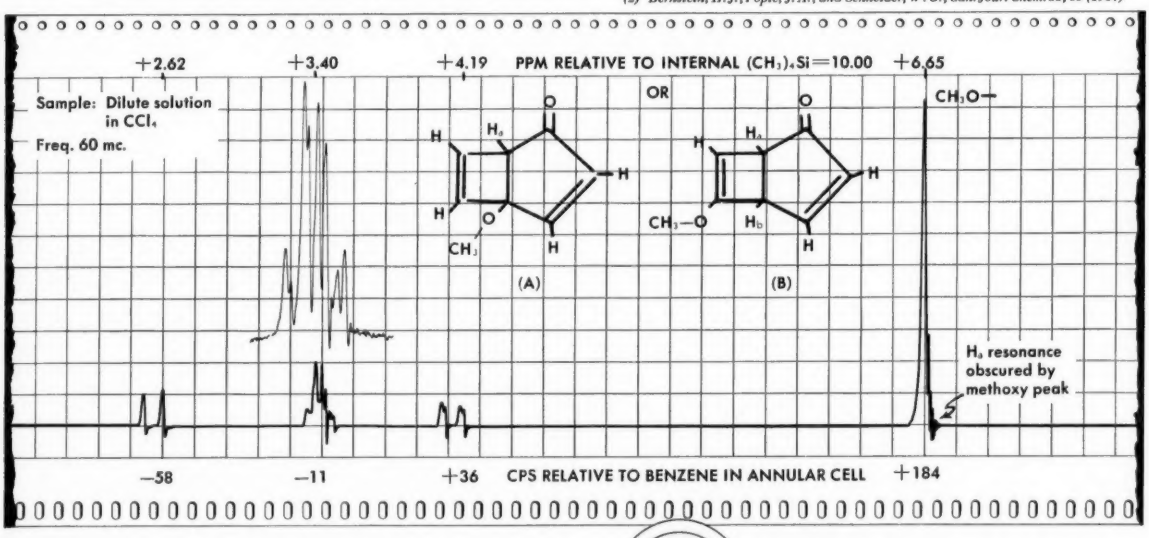
**58 of a series**

## STRUCTURE OF PHOTO-GAMMA-TROPOLONE METHYL ETHER

**INTERPRETATION.** The isomerization product of gamma-tropolone[1] which results from irradiation by light was thought to have either structure A or B as shown below. The peaks at —58 and +36 cps are characteristic of the protons attached to the doubly-bonded carbon atoms $\beta$ and $\alpha$ to the carbonyl in the 5-ring. They couple their spins together to give the doubling of these signals. The absence of further coupling to the $\beta$-proton at —58 cps suggests that structure B ought to be ruled out, since an observable coupling ought to result from the proton, $H_b$, at the ring junction. Structure A is confirmed by the complex multiplet at —11, characteristic of protons on doubly-bonded carbons in a 4-ring. This is an AB multiplet[2] requiring two such protons, whereas structure B could only furnish one. Both protons show additional small couplings to the angular proton, $H_b$, which is not unexpected. $H_a$ also sees the $\alpha$-proton at +36 cps with a coupling of less than 2 cps. The resonance from $H_a$ is therefore rather complex, but is nearly totally obscured by virtue of accidently falling directly beneath the intense methoxy peak. A very slow sweep reveals signs of its presence. Structure B is further ruled out by the absence of any resonance attributable to an angular proton of type $H_b$ which would surely lie higher than $H_a$.

*(1) This sample was furnished by Dr. Orville L. Chapman, Department of Chemistry, Iowa State College. His permission to describe these results is greatly appreciated.*

*(2) Bernstein, H.J., Pople, J.A., and Schneider, W.G., Can. Jour. Chem. 35, 65 (1957)*

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